

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:
**Purdue University Agricultural Experiment
 Station and ARS-USDA**

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW,* [THE RIGHT TO EX-
 IDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM.] TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS OF THE OWNER OF THE RIGHTS. (34 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

* [Waived]

COMMON WHEAT

'Caldwell'

In Testimony Whereof, I have hereunto set
 my hand and caused the seal of the Plant
 Variety Protection Office to be affixed
 at the City of Washington
 this 27th day of May in
 the year of our Lord one thousand nine
 hundred and eighty-two.

Attest:

Kenneth F. [Signature]
 Acting
 Commissioner
 Plant Variety Protection Office
 Grain Division
 Agricultural Marketing Service

John R. Block [Signature]
 Secretary of Agriculture

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION

FORM APPROVED
OMB NO. 40-R3822

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

INSTRUCTIONS: See Reverse.

No certificate for plant variety protection may be issued unless a completed application form has been received (5 U.S.C. 553).

1a. TEMPORARY DESIGNATION OF VARIETY <u>Purdue 65256A1-8-7</u>		1b. VARIETY NAME <u>Caldwell</u>		FOR OFFICIAL USE ONLY PV NUMBER <u>8100165</u>	
2. KIND NAME <u>Wheat</u>		3. GENUS AND SPECIES NAME <u>Triticum aestivum</u>		FILING DATE <u>9/8/81</u>	TIME <u>12:00</u> A.M. P.M.
4. FAMILY NAME (BOTANICAL) <u>Gramineae</u>		5. DATE OF DETERMINATION <u>January 1, 1981</u>		FEE RECEIVED \$ <u>500.00</u> \$ <u>250.00</u>	DATE <u>9/8/81</u> <u>1/22/82</u>
6. NAME OF APPLICANT(S) <u>Director, Purdue Univ. Agric. Experiment Station and ARS-USDA</u>		7. ADDRESS (Street and No. or R.F.D. No., City, State, and ZIP Code) <u>Purdue University</u> <u>West Lafayette, IN 47907</u>		8. TELEPHONE AREA CODE AND NUMBER <u>317-494-8360</u>	
9. IF THE NAMED APPLICANT IS NOT A PERSON, FORM OF ORGANIZATION: (Corporation, partnership, association, etc.) <u>Agricultural Experiment Station</u>		10. IF INCORPORATED, GIVE STATE AND DATE OF INCORPORATION <u>Established by Federal Law</u> <u>(Hatch Act)</u>		11. DATE OF INCORPORATION <u>1889</u>	
12. NAME AND MAILING ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS: <u>Dr. B. R. Baumgardt, Director</u> <u>Purdue University Agricultural Experiment Station</u> <u>West Lafayette, IN 47907</u>					

13. CHECK BOX BELOW FOR EACH ATTACHMENT SUBMITTED:

- ☒ 13A. Exhibit A, Origin and Breeding History of the Variety (See Section 52 of the Plant Variety Protection Act.)
- ☒ 13B. Exhibit B, Novelty Statement.
- ☒ 13C. Exhibit C, Objective Description of the Variety (Request form from Plant Variety Protection Office.)
- ☒ 13D. Exhibit D, Additional Description of the Variety.

14a. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a). (If "Yes," answer 14B and 14C below.) ☒ YES ☐ NO

14b. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? ☒ YES ☐ NO

14c. IF "YES," TO 14B, HOW MANY GENERATIONS OF PRODUCTION BEYOND BREEDER SEED? ☒ FOUNDATION ☒ REGISTERED ☒ CERTIFIED

15a. DID THE APPLICANT(S) FILE FOR PROTECTION OF THIS VARIETY IN OTHER COUNTRIES? ☐ YES ☒ NO (If "Yes," give name of countries and dates.)

15b. HAVE RIGHTS BEEN GRANTED THIS VARIETY IN OTHER COUNTRIES? ☐ YES ☒ NO (If "Yes," give name of countries and dates.)

16. DOES THE APPLICANT(S) AGREE TO THE PUBLICATION OF HIS/HER (THEIR) NAME(S) AND ADDRESS IN THE OFFICIAL JOURNAL? ☐ YES ☐ NO

17. The applicant(s) declare(s) that a viable sample of basic seed of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

August 13, 1981
(DATE)

B. R. Baumgardt
(SIGNATURE OF APPLICANT)

(DATE)

(SIGNATURE OF APPLICANT)

13A. Exhibit A, Origin and Breeding History of Caldwell.

Caldwell (CI 17897) was developed by the Purdue University Agricultural Experiment Station in cooperation with ARS, U. S. Department of Agriculture. Caldwell resulted from a backcross of Siete Cerros to a Purdue parental line. The parentage is P5724B3-5P-8-2*2/Siete Cerros. P5724B3-5P-8-2 was derived from the same cross as Benhur. The parentage of Benhur has been published (Crop Sci. 17:527-528).

Following one backcross the new variety was developed by the modified pedigree method of breeding with plant selections made in the F_1 , F_2 , and F_7 generations. Finally in 1978, in the F_{13} generation, twelve plant progeny rows, the most highly resistant to Septoria leaf blotch among 100 progeny rows, were composited for breeders' seeds. In 1980 breeders' seed was in the F_{15} generation of selfing.

Caldwell was tested for performance in advanced nursery yield trials from 1975 to 1980, in over-state drill plot trials in 1978 and 1980, and in the Uniform Eastern Soft Red Winter Performance Nursery from 1978 to 1980. It has also been tested in disease nurseries at Lafayette, Indiana from 1973 to 1980.

Soft wheat quality was evaluated from 1978 over-state drill plot trials and from the Uniform Eastern Soft Red Winter Performance Nursery in 1978 and 1979. Preliminary quality evaluations were made from nursery yield samples from 1975 to 1977 and in 1979.

Caldwell has been true breeding during our observations in developing breeders' seed. No other variants were observed. We consider Caldwell to be true-breeding.

12/15/81

13A. Exhibit A for Caldwell (cont.)

The height of Caldwell plants is influenced by microenvironmental factors. Often a single tiller, sometimes two, may grow 5 to 10 cm taller than the average. A tall single tiller is frequent and typical in Caldwell.

Caldwell has less than one percent of plants with a green rather than a yellow-green spike at flowering. These are generally 10 to 15 cm taller than the average plants of Caldwell. No other variants were observed. We consider Caldwell to be true-breeding.

D12/15/81

13B. Exhibit B, Novelty Statement.

Caldwell is a soft red winter wheat variety with a unique combination of earliness, high milling and baking quality, and resistance to diseases and to Hessian fly.

Caldwell has a maturity similar to Arthur and is about 4 cm shorter than Arthur (Table 1). It has been superior to other standard varieties in milling and baking qualities (Table 10).

Caldwell is resistant to Septoria leaf blotch with a genetic source different from that of Oasis, Beau or Sullivan wheats (Table 7). It is moderately resistant to the races of Puccinia recondita and Erysiphe graminis currently prevalent in Indiana (Tables 8 and 9).

Hessian fly resistance is governed by the H6 gene.

Caldwell is one of the most resistant varieties to barley yellow dwarf.

The kernel size of Caldwell is smaller than most other commercial varieties due in part to its tendency to set third and fourth kernels per spikelet.

Exhibit B

(Add to original Exhibit B.) Caldwell is most like Arthur and is currently resistant in Indiana to Septoria leaf blotch, powdery mildew, and leaf rust whereas Arthur is susceptible. Caldwell has the H₆ gene for resistance to Hessian fly whereas Arthur, Monon, Roland, and Double-crop have H₃ and Arthur 71, Abe, Oasis, Beau, Sullivan and Downy have gene H₅ for resistance.

Caldwell is resistant to Septoria leaf blotch whereas Benhur is not. Caldwell is a winter type whereas Siete Cerros, a parent of Caldwell, is a spring type.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (TRITICUM SPP.)

INSTRUCTIONS: See Reverse.

NAME OF APPLICANT(S) Director,	FOR OFFICIAL USE ONLY
Purdue University Agricultural Experiment Station	PVPO NUMBER 8100165
ADDRESS (Street and No. or R.F.D. No., City, State, and ZIP Code)	VARIETY NAME OR TEMPORARY DESIGNATION
West Lafayette, IN 47907	Caldwell

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. or) when number is either 99 or less or 9 or less.

1. KIND:

1 = COMMON 2 = DURUM 3 = EMMER 4 = SPELT 5 = POLISH 6 = POULARD 7 = CLUB

2. TYPE:

1 = SPRING 2 = WINTER 3 = OTHER (Specify) 1 = SOFT 3 = OTHER (Specify)
2 = HARD

1 = WHITE 2 = RED 3 = OTHER (Specify)

3. SEASON - NUMBER OF DAYS FROM EMERGENCE TO:

FIRST FLOWERING LAST FLOWERING

4. MATURITY (50% Flowering):

NO. OF DAYS EARLIER THAN 1 = ARTHUR 2 = SCOUT 3 = CHRIS
 NO. OF DAYS LATER THAN 4 = LEMHI 5 = NUGAINES 6 = LEEDS

5. PLANT HEIGHT (From soil level to top of head):

CM. HIGH
 CM. SHORTER THAN 1 = ARTHUR 2 = SCOUT 3 = CHRIS
4 = LEMHI 5 = NUGAINES 6 = LEEDS

6. PLANT COLOR AT BOOTING (See reverse):

1 = YELLOW GREEN 2 = GREEN 3 = BLUE GREEN

7. ANTHUR COLOR:

1 = YELLOW 2 = PURPLE

8. STEM:

Anthocyanin: 1 = ABSENT 2 = PRESENT
 Hairiness of last internode of rachis: 1 = ABSENT 2 = PRESENT
 NO. OF NODES (Originating from node above ground)
 Waxy bloom: 1 = ABSENT 2 = PRESENT
 Internodes: 1 = HOLLOW 2 = SOLID
 CM. INTERNODE LENGTH BETWEEN FLAG LEAF AND LEAF BELOW

9. AURICLES:

Anthocyanin: 1 = ABSENT 2 = PRESENT
 Hairiness: 1 = ABSENT 2 = PRESENT

10. LEAF:

Flag leaf at booting stage: 1 = ERECT 2 = RECURVED
3 = OTHER (Specify): Flag leaf: 1 = NOT TWISTED 2 = TWISTED
 Hairs of first leaf sheath: 1 = ABSENT 2 = PRESENT
 Waxy bloom of flag leaf sheath: 1 = ABSENT 2 = PRESENT
 MM. LEAF WIDTH (First leaf below flag leaf)
 CM. LEAF LENGTH (First leaf below flag leaf)

11. HEAD:

☐ 1 Density: 1 = LAX 2 = DENSE ☐ 1 Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE
4 = OTHER (Specify) _____

☐ 3 Awedness: 1 = AWNLESS 2 = APICALLY AWNLETED 3 = AWNLETED 4 = AWNED

☐ 2 Color at maturity: 1 = WHITE 2 = YELLOW 3 = PINK 4 = RED
5 = BROWN 6 = BLACK 7 = OTHER (Specify): _____

☐ 0 ☐ 9 CM. LENGTH ☐ 1 ☐ 2 MM. WIDTH

12. GLUMES AT MATURITY:

☐ 2 Length: 1 = SHORT (CA. 7 mm.) 2 = MEDIUM (CA. 8 mm.) 3 = LONG (CA. 9 mm.) ☐ 2 Width: 1 = NARROW (CA. 3 mm.) 2 = MEDIUM (CA. 3.5 mm.)
3 = WIDE (CA. 4 mm.)

☐ 3 Shoulder 1 = WANTING 2 = OBLIQUE 3 = ROUNDED
shape: 4 = SQUARE 5 = ELEVATED 6 = APICULATE

☐ 1 Beak: 1 = OBTUSE 2 = ACUTE 3 = ACUMINATE

13. COLEOPTILE COLOR:

☐ 1 1 = WHITE 2 = RED 3 = PURPLE

14. SEEDLING ANTHOCYANIN:

☐ 2 1 = ABSENT 2 = PRESENT

15. JUVENILE PLANT GROWTH HABIT:

☐ 2 1 = PROSTRATE 2 = SEMI-ERECT 3 = ERECT

16. SEED:

☐ 1 Shape: 1 = OVATE 2 = OVAL 3 = ELLIPTICAL

☒ 2 ^{12/15/81} Brush: 1 = SHORT 2 = MEDIUM 3 = LONG

☐ 4 Phenol reaction 1 = IVORY 2 = FAWN 3 = LT. BROWN
(See instructions): 4 = BROWN 5 = BLACK

☐ 3 Color: 1 = WHITE 2 = AMBER 3 = RED 4 = PURPLE 5 = OTHER (Specify) _____

☐ 0 ☐ 6 MM. LENGTH ☐ 0 ☐ 3 MM. WIDTH ☐ 2 ☐ 8 GM. PER 1000 SEEDS

17. SEED CREASE:

☐ 1 Width: 1 = 60% OR LESS OF KERNEL 'WINOKA'
2 = 80% OR LESS OF KERNEL 'CHRIS'
3 = NEARLY AS WIDE AS KERNEL 'LEMHI'

☐ 2 Depth: 1 = 20% OR LESS OF KERNEL 'SCOUT'
2 = 35% OR LESS OF KERNEL 'CHRIS'
3 = 50% OR LESS OF KERNEL 'LEMHI'

18. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

☐ 2 STEM RUST (Races) 15, 17, 151 ☐ 2 LEAF RUST (Races) 5, 15, 35, 76
104, UN9 ☐ 0 STRIPE RUST (Races) ☐ 0 LOOSE SMUT

☐ 2 POWDERY MILDEW ☐ 0 BUNT ☐ 2 OTHER (Specify) Septoria leaf blotch, BYDV

19. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

☐ 0 SAWFLY ☐ 1 APHID (Bydv.) ☐ 0 GREEN BUG ☐ 1 CEREAL LEAF BEETLE

☐ OTHER (Specify) _____ HESSIAN FLY RACES: ☐ 2 GP ☐ 2 A ☐ 2 B ☐ 1 C
☐ 1 D ☐ 0 E ☐ 0 F ☐ 0 G

20. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	Arthur	Seed size	Monon
Leaf size	Beau	Seed shape	Arthur
Leaf color	Arthur	Coleoptile elongation	Arthur
Leaf carriage	Beau	Seedling pigmentation	Arthur

INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for the standardization of terms and procedures for completing this form:

- (a) L.W. Briggie and L. P. Reitz, 1963, Classification of Triticum Species and Wheat Varieties Grown in the United States, Technical Bulletin 1278, United States Department of Agriculture.
- (b) W.E. Walls, 1965, A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity, contribution No. 28 to the handbook of seed testing prepared by the Association of Official Seed Analysts. (See attachment.)

LEAF COLOR: Nickerson's or any recognized color fan should be used to determine the leaf color of the described variety.

13D. Exhibit D, Description of Additional Characteristics.

Caldwell is a short, early variety with good standing ability. It has an excellent yield record and is adapted to Indiana and some nearby states (Tables 1, 2, 3, and 4). Test weight has been lower than Arthur.

Caldwell has excellent milling quality, good baking quality, good cookie-baking quality and acceptable cake-baking quality (Table 5).

Caldwell is moderately resistant to barley yellow dwarf similar to the level of resistance of Hart (Table 6). This is superior to other commercial soft red winter wheats tested by us.

It has a genetic source of resistance to the Septoria leaf blotch different from that effective in the other early maturing soft red winter wheats Oasis, Beau, and Sullivan (Table 7). Resistances to powdery mildew and to leaf rust are of different sources than other early maturing soft red winter wheat varieties.

Caldwell has an intermediate level of winterhardiness (Table 11). It is more winterhardy than Benhur, but less winterhardy than Arthur, Monon, Oasis, or Beau.

Caldwell has a moderate tolerance to aluminum in acid soils (Table 11).

Plant color at booting is green like Arthur. A slight waxy bloom is present on stems. Auricles are generally green but may show some purple color. The flag leaf is recurved to inclined at booting. Glumes are yellow green at flowering like Monon. Seedlings generally are green but may show slight purpling.

Table 1. Comparative performance in nursery plots at Lafayette, Indiana, 1975-80.

	Yield	Test Wt.	Kernel Wt.	Headed	Height	Pre-ripe	Post-ripe
	(5)*	(5)	(5)	May (6)	(6)	straw score** (5)	straw score** 1979 (0-9)
	(bu/A)	(lbs/bu)	(g/1000)		(in)	(0-9)	(0-9)
Caldwell	78.4	59.1	28.9	21.5	34.2	3.0	4
Benhur	67.2	60.2	---	21.0	36.8	4.0	4
Arthur	72.0	60.0	35.7	21.0	35.5	5.0	5
Monon	64.1	59.2	36.0	20.0	38.3	4.8	7
Oasis	68.0	59.9	---	23.3	34.8	4.8	6
Beau	71.9	60.8	36.5	22.8	33.2	2.8	3
S. E.	2.0	ns	1.3	0.6	1.0	0.6	

*Number of years in mean. Yields were not measured in 1978 because of severe winter-killing.

**Scored 0 = erect to 9 = lodged flat. Post-ripe straw was rated 3 weeks after maturity.

+Standard error of the difference between variety means.

Table 2. Porter County winter wheat performance trials, two-year average, 1978 and 1980*.

Variety	Yield**	Test			Winter-kill	Date headed
		Weight	Lodging	Height		
	bu/A	lb/bu	%	in	%	
Auburn	72.7 a	60.3	0	34	4	6-01
Caldwell	71.2 ab	59.1	0	34	11	6-01
Abe	67.2 ab	60.2	0	35	11	6-01
Titan	67.1 ab	57.9	0	37	9	6-04
S76	66.6 ab	58.9	0	33	9	6-02
Roland	66.4 ab	57.6	0	32	11	6-02
Arthur	66.2 ab	60.6	0	37	9	5-31
Beau	65.0 ab	61.1	0	35	11	6-01
Arthur 71	64.7 ab	60.5	0	36	9	6-01
Sullivan	64.4 ab	60.9	0	36	9	6-01
Hart	64.0 ab	59.1	0	36	14	6-02
Monon	59.8 ab	60.2	0	39	14	5-30
Downy	59.0 b	59.4	0	36	14	6-01
	-----	-----	-----	-----	-----	-----
Grand Mean	65.7	59.7	0	35	10	6.01

C. V. = 3.6%

* Data from performance trials of K. M. Day and reported in part in Purdue University Agric. Exp. Stn. Bull. 211 (1979) and 290 (1980).

**Means followed by the same letter or letters are not statistically different as determined by the Student-Newman-Keuls LSR Test at the 0.10 level of probability.

Table 3. Knox County winter wheat performance trials, two-year average, 1978 and 1980*.

Variety	Yield**	Test			
		Weight	Lodging	Height	Winterkill
	bu/A	lb/bu	%	In	%
Hart	75.0 a	57.1	1	42	1
Caldwell	73.4 a	56.7	1	37	1
Auburn	70.4 a	58.1	0	39	1
S76	69.2 a	56.6	0	40	1
Titan	69.2 a	56.5	3	44	1
Roland	68.6 a	56.3	0	37	1
Abe	68.3 a	58.3	1	39	1
S78	67.7 a	55.8	0	36	1
Arthur	67.5 a	58.7	1	42	1
Sullivan	65.0 a	58.9	2	42	1
Beau	64.4 a	59	0	39	2
Arthur 71	61.5 a	58.7	1	41	1
Monon	59.3 a	58.2	6	43	1
	-----	-----	---	--	---
Grand Mean	67.7	57.6	1	40	1

C. V. = 6.6%

* Data from performance trials of K. M. Day, and reported in part in Purdue University Agric. Exp. Stn. Bull. 211 (1979) and 290 (1980).

** Means followed by the same letter or letters are not statistically different as determined by the Student-Newman-Keuls LSR test at the 0.10 level of probability.

Table 4. Statewide 1980 winter wheat performance trials, average of four locations*.

Variety	Yield**	Test Weight	Lodging	Plant Height	Winter- kill
	bu/A	lb/bu	%	in	%
Caldwell	86.0 a	58.9	1	37	1
Titan	82.1 ab	57.7	2	41	1
Pike	81.3 ab	58.8	3	38	1
Hart	80.0 abc	58.5	4	41	1
Auburn	79.5 abc	59.4	0	37	1
Roland	78.2 abcd	58.4	0	35	1
Abe	75.7 bcde	59.5	6	37	1
Arthur	72.8 bcde	59.6	5	41	1
Arthur 71	72.2 bcde	59.8	7	39	2
Sullivan	70.8 cde	59.7	6	39	1
Beau	70.6 cde	59.9	0	37	2
Downy	70.1 cde	58.9	6	34	2
Dancer	68.7 de	59.9	16	43	1
Monon	67.3 e	59.2	13	43	2
Grand Mean	75.4	59.2	5	41	1

C. V. = 4.4%

* Data from performance trials of K. M. Day and O. W. Luetkemeier and reported by individual locations in Purdue Univ. Agric. Exp. Stn. Bull. 290 (1980).

** Means followed by the same letter or letters are not statistically different as determined by the Student-Newman-Keuls LSR test at the 0.10 level of probability.

Table 5. Quality characteristics of wheat varieties as determined by the Soft Wheat Quality Laboratory, Wooster, OH for the 1978 crop⁺.

Variety	Milling quality score	Baking quality score	Millability score	Cookie diameter score		Cake volume score	
Uniform Eastern Soft Red Winter Wheat Nursery							
Caldwell	108.0A [‡]	109.9A	123.0	18.4	7	1058	84
Knox 62*	100.0A	100.0A	113.4	18.1	5	1065	80
Oasis	95.2B	103.6A	106.4	18.1	7	1094	80
Sullivan	93.0C	99.6B	104.8	17.9	6	1078	83
Downy	92.6C	103.4A	103.1	18.1	6	1052	81
Trumbull	84.5E	87.8D	93.4	18.4	7	1058	84
Indiana Drill Plot Over-state Composite Samples ⁺							
Caldwell	108.1A	94.1C	108.1	17.9	6	1074	83
Arthur**	100.0A	100.0A	100.1	17.7	7	1047	91
Monon	94.9C	87.2D	92.9	17.4	6	1071	87
Abe	89.3D	92.3C	84.0	17.7	7	1061	89
Oasis	88.9D	87.8D	85.4	17.7	7	1082	87
Beau	90.7C	90.9C	87.7	17.8	7	1082	88
Sullivan	96.5B	93.5C	95.4	17.9	7	1045	85

*, ** Standards for the respective tests.

⁺ Twenty-pound sample size.

[‡] Letters following scores indicate quality classifications in relation to the standard (check) variety. Letter A indicates a score as good as or better than the standard variety; letter B indicates a score measurably inferior to the standard for one character contributing to the milling or baking score; letter C, measurably inferior for two characters, etc.

Table 6. Comparative reactions to virus diseases of wheat varieties in nursery trials, 1975 - 1979.

	Soil-borne mosaic (6)*	Spindle streak mosaic (1979)	Barley yellow dwarf	
	0-9	0-9	0-9	0-9
Caldwell	5.7**	5.5**	5*	2
Arthur	4.1	6.5	6	4
Monon	2.8	2.5	6	3
Oasis	5.3	5.0	--	4
Beau	4.7	5.5	--	5
Redcoat	6.3	6.0	--	--
S. E. ‡	0.6	---	--	--

* Number of years' data in mean.

** Reactions to disease scored from 0 = immune to 9 = very susceptible.

+ Artificially infested with viruliferous aphids in the field in the fall at Lafayette, IN. Scored: 0 = no stunting to 9 = severe stunting.

‡ Standard error of the difference between variety means.

Table 7. Adult plant reaction to Septoria tritici in the field at Lafayette, IN.

	<u>1978</u>		<u>1975</u>		<u>1976</u>
	Severity*	Reaction type**	Severity	Reaction type**	Severity
	%		%		%
Caldwell	37	B	15	B	26
Benhur	37	C	60	D	37
Arthur	37	D	50	D	55
Monon	55	D	40	C	55
Oasis	55	A	5	A	26
Beau	55	C	5	B	26

* Severity rated as percent of the area of the upper four leaves necrotic.

** Reaction type: A = no pycnidia to D = abundant pycnidia in lesions.

Table 8. Reaction to powdery mildew in the adult stage in the field and
for seedlings in the greenhouse.*

	<u>Infection in field**</u>		Seedling reaction
	1979	1976	in 1978 (0 - 4) ⁺
	%	%	
Caldwell	15	0-5	3 ⁺
Benhur	10	10	4
Arthur	40	7	3
Monon	80	25	4
Oasis	30	7	3
Beau	25	3	2 ⁺

* Naturally occurring races of the pathogen.

** Percent leaf area affected.

⁺ Plant reactions:

2 = small colonies with sparse conidial chains lightly
sporulating to 4 = large colonies with dense conidial
chains and heavily sporulating.

Table 9. Leaf rust severity and reaction type at the adult plant stage in the field*.

	Percent infection and infection type**				
	1980	1979	1978	1976	1975
Caldwell	Tr R	1R	2R	0R	0R
Benhur	Tr R	10MS-MR	10M	20MS	R-50MS
Arthur	20 S	10S	5MS	20MS	2MS
Monon	40 S	60S	60S	70S	50S
Oasis	5 S	2S	10MS	0R	0R
Beau	3 S	2S	15MS	7MS	R-20MS

* To races of Puccinia recondita of the pathogen occurring naturally at Lafayette, IN.

**Percent of flag leaf area (modified Cobb scale) covered by uredinia. Tr = trace;
R = resistant fleck reaction; S = large sporulating uredinia; M = "moderately".

Table 10. Stem rust severity and reaction type at the adult plant stage in the field at Lafayette, IN.

	1979*		1975*	
	Severity**	Reaction type ⁺	Severity**	Reaction type ⁺
	%		%	
Caldwell	1	R	0	R
Benhur	Tr	R	0	R
Arthur	1	MR	0	R
Monon	10	MS	5	S
Oasis	Tr	MR	0	R
Beau	2	MS	0-1	R-S

* Races 15TMN, 15TLM, 151QFB, 151QCB, and 17HDL of Puccinia graminis.

** Percent of flag leaf sheath and peduncle area (modified Cobb scale) covered by uredinia.

⁺ R = resistant fleck reaction; S = large sporulating uredinia; M = "moderately".

Table 11. Comparative winterhardiness and tolerance to aluminum.

	Winter survival in 1978(%) [*]				Aluminum tolerance score ⁺ (1 - 6)
	Nursery	Field plots			
	Yield plots				
	Lafayette, IN ^{**}	Tippecanoe Co. ^{**}	Porter Co.	Knox Co.	
Caldwell	36	30	80	100	2
Benhur	23	—	—	—	—
Arthur	48	67	85	100	5
Monon	50	47	75	100	3
Oasis	46	52	85	100	6
Beau	58	47	80	100	6
Hart	32	22	75	100	—

* Averages of four replications in the field

** 1978 was a very severe test at Lafayette, IN for winterhardiness.

+ In liquid culture and scored 1 = excellent to 6 = poor.